CONTROL OF ACTIVE DEFENSES OF JOINT THEATER MISSILE DEFENSE: WHOSE MISSION IS IT?

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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This thesis investigated the command and control doctrine and infrastructure that surrounded the employment of a new suite of weapon systems designed to counter an emerging threat. It assessed the current doctrine, command and control infrastructure and TBM defense system technologies in relation to active defenses against the threat in order to answer the question: Who should control active defenses against ballistic and cruise missiles?

This thesis explored two subproblems. The first subproblem was to identify, analyze and interpret the existing joint and service doctrine on command and control aspects of active defenses against ballistic and cruise missiles. The second subproblem was to identify, analyze and interpret historical aspects of the evolution of current joint command and control doctrine that might be illustrative to the main problem statement.

This thesis recommends changes to joint doctrine and command and control infrastructure to improve the efficacy of active theater missile defenses.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army command and General Staff College or any other governmental agency. (Reference to this study should include the foregoing statement.)

ABSTRACT

CONTROL OF ACTIVE DEFENSES OF JOINT THEATER MISSILE DEFENSE: WHOSE MISSION IS IT? By Major Richard S. Girven, USA, 73 pages.

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CHAPTER ONE

INTRODUCTION

> Belgian officials recently intercepted a highly sophisticated Russian-built surface-to-air missile command post, known as the Rangir. The Rangir provides command and control for a number of air defense missile systems. The Belgians believe the equipment was bound for Iraq. Documentation found with the Rangir indicated that several shipments had already been sent to the Middle East. If Iraq is able to secure sophisticated weapons under the watchful eye of UN observers, imagine how easily other potential adversaries are arming themselves.[1]
>
> Major General James J. Cravens, Army

The Importance of the Study

In 1988, just two years prior to Operation Desert Storm, the U.S. Army, in cooperation with U.S. defense contractors, fielded the first anti-tactical missile variant of the original Patriot missile system. Later, the army began testing an upgraded version of the missile which would give the system a limited capability to defend against missiles over small areas proximate to the Patriot unit. When Iraq invaded Kuwait in August of 1990, only two test versions of these upgraded missiles were in existence. By the start of the war in January 1991, over 500 upgraded Patriot missiles had been built and multiple Patriot units deployed to defend against tactical ballistic missiles (TBMs).[2]

While this was not a mission for which the system had been initially designed nor for which most units had trained, it was a mission that would engage the attention of the world and change the nature of air defense in future operations. The navy deployed Aegis air defense systems with similar capabilities and the Allied Coalition was

thus provided a limited degree of protection from Saddam Hussein's Scud missiles.

Today, the number of countries which have built, have bought, or are acquiring TBMs is growing rapidly; and as a result, international political and regional military threats to U.S. vital interests are increasing. Accordingly, lessons learned from Desert Storm and a greater awareness of the tactical missile threat have caused the Ballistic Missile Defense Organization (BMDO) to dedicate more resources and effort in countering the tactical missile threat.

The BMDO, the Department of Defense (DOD) organization responsible for overall coordination of U.S. missile defense efforts, currently spends two-thirds of its budget (1.9 billion of nearly 3 billion dollars), on theater missile defense initiatives.[3] Accordingly, awareness of the rapidly proliferating threat and corresponding possibilities for increased budgets may have contributed to the current surge of multiple simultaneous efforts by the services to field missile defense systems.

While billions of dollars are being poured into the research, development, testing, and fielding of advanced systems, however, command and control doctrine and infrastructure for TBM defenses (TBMD) continue to be disputed subjects among commentators and more importantly, among the services. Current joint theater missile defense (TMD) doctrine does not provide adequate guidance for the resolution of key issues in command and control. An extension of recent initiatives to review service roles and missions, the TBM doctrine debate is wrapped up in the issue: who is in charge of TBMD, or more direct and to the point, who should be in charge?[4]

The Problem Statement

This thesis investigated the command and control doctrine and infrastructure that surrounded the employment of a new suite of weapon systems designed to counter an emerging threat. It assessed the current doctrine, command and control infrastructure, and TBM defense system technologies in relation to active defenses against the threat in order to answer the question: Who should control active defenses against ballistic and cruise missiles?

The First Subproblem. The first subproblem was to identify, analyze, and interpret the existing joint and service doctrine on command and control aspects of active defenses against ballistic and cruise missiles.

The Second Subproblem. The second subproblem was to identify, analyze and interpret historical aspects of the evolution of current joint command and control doctrine that might be illustrative to the main problem statement.

The Hypotheses. The first hypothesis stated that doctrine for command and control of active defenses against theater missiles remained unclear and open to unnecessary and counterproductive interpretation by the services, and because this, future TMD operations would be ad hoc in nature and less than adequate to meet the needs of the regional Commanders in Chief (CINCs).

The second hypothesis stated that more definitive joint guidance would reduce debate among the services and improve the efficiency and capability of active defenses against theater missiles.

Limitations

The research for this thesis was limited to official documents, published literature and where necessary, some coordinating drafts of future documents. The information cutoff date is 31 March, 1997. While

some informal agreements on command and control structure might exist between the services and the geographic CINCs, this information would not be available for inclusion in the study.

The Delimitations

This thesis focused primarily on the command and control aspect of active defenses against theater missiles. It looked exclusively at U.S. joint and service doctrine and did not look to other nations or the international business community for examples or solutions. This study did not include extensive research or analysis into command and control doctrine for attack operations. It did not include discussion of passive defense measures or ballistic missile command, control, coordination, communications and intelligence (BMC4I) systems beyond what was necessary to explain or refine pertinent aspects of theater active defense.

The study did not attempt to compare or analyze the relative detailed capabilities of existing active defense systems beyond the general appreciation needed to understand major differences in concept and application. Finally, the study did not investigate current debate on anti-ballistic missile (ABM) treaties which might have impact on future active defense system design and development.

Definition of Terms

This section introduces terms which may be helpful in understanding the remainder of the thesis. While this is not a comprehensive appendix of missile defense terminology, it does cover most of the terms used later in the text which require some explanation.

Active Defense. Active defense involves in-flight destruction of incoming missiles and airborne launch platforms, and includes multi-tiered defense in depth to achieve maximum engagements, and active electronic warfare measures to disrupt remote or onboard guidance systems.

Air Breather. An air-breather is a flying vehicle that uses the oxygen in the atmosphere as the oxidizer in its propulsion system. Traditionally, this term was used to describe the threat from enemy jet aircraft, but by definition must include cruise missiles. This category does not include ballistic missiles.

Attack Operations. Attack operations are designed to "prevent the launch of theater missiles by attacking each element of the overall system, including such actions as destroying launch platforms, reconnaissance, surveillance, and target acquisition platforms, command and control nodes, and missile stocks and infrastructure."[5]

Ballistic Missile Command, Control, Coordination, Communications, and Intelligence. (BMC4I) The BMC4I system links the other three operational elements together to provide "timely assessment of the threat, rapid dissemination of tactical warning, and mission assignment, targeting data, and post-strike assessments." It is designed to utilize "existing joint and service C4I systems and resources efficiently to ensure integration with other operational functions and to optimize the use of scarce resources."[6]

Boost Phase. That portion of the flight of a ballistic missile during which the booster and sustainer engines operate. During this phase, which usually lasts three to five minutes for an ICBM, the missile reaches an altitude of about 200 kilometers whereupon powered flight ends and the missile begins to dispense its reentry vehicles.

Cruise Missile. Unmanned, powered, typically self-guided cehicles that fly at one or more predetermined constant (cruise) altitudes and carry a lethal payload.[7]

Functions. Functions date from 1947 when President Truman issued an executive order on the functions of the armed forces. Functions are the specific responsibilities assigned by the national command authorities to enable the services to fulfill their legally established roles. "Thus, the primary function of the Services is to provide forces organized, trained, and equipped to perform a role: to be employed by a combatant commander in the accomplishment of a mission."[8]

Hit to Kill. The combined accuracy and lethality of an active defense system that allows it to destroy a threat missile upon impact.

Joint Requirements Oversight Council (JROC). A council, chaired by the vice chairman, Joint Chiefs of Staff, that conducts requirements analyses, determines the validity of mission needs, and develops recommended joint priorities for those needs it approves, and validates performance objectives and thresholds in support of the Defense Acquisition Board. Council members include the vice chiefs of the U.S. Army, Navy, and Air Force, and the assistant commandant of the Marine Corps.[9]

Joint Theater Missile Defense (JTMD). JTMD involves the "integration of joint force capabilities to destroy enemy theater missiles in flight or prior to launch, or to otherwise disrupt the enemy's theater missile operations" through an appropriate mix of systems and procedures.[10] This is accomplished through the balanced application of the four operational elements of JTMD, namely passive defense measures, active defense measures, attack operations, and BMC4I.

Midcourse Phase. That portion of a ballistic missile's trajectory between the boost phase and the reentry phase when reentry vehicles and penaids travel at ballistic trajectories above the atmosphere. During

this phase, a missile releases its warheads and decoys and is no longer a single object, but rather a swarm of reentry vehicles and penaids falling freely along present trajectories in space.[11]

Missions. Missions date from the Department of Defense Reorganization Act of 1958 and are the tasks assigned by the national command authorities to the combatant commanders. Under this act the services became force providers for the combatant commanders who are in turn responsible for carrying out broad operational missions. It is the (geographic) combatant commanders and not the services who plan missions and allocate and apportion forces.[12]

Operational Control (OPCON). Operational control is transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders.[13]

Passive Defense. Passive defenses are all those measures taken to reduce the effects of an enemy missile attack including but not limited to tactical warning, reducing targeting effectiveness, reducing vulnerability, and recovery and reconstitution. Examples of specific passive defense measures include deception operations, camouflage, concealment, early warning or attack, and nuclear, biological, and chemical protective measures.[14]

Roles. Roles date from the National Security Act of 1947, which established the basic purpose of each service by law. The current roles of the services are outlined in Title 10, of the U.S. Code and while different in environment, are relatively functionally similar across all the services. Basically, roles help establish each service's primacy in its respective environment or arena of war: land, sea, or air.[15]

Tactical Control (TACON). Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is, limited to the detailed and usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to and exercised at any level at or below the level of combatant command.[16]

Terminal Phase. That final portion of a ballistic missile's trajectory between the midcourse phase and trajectory termination. With most ballistic missiles, the terminal phase is unguided, though advances in technology have made terminal guidance possible, a development which complicates the targeting solution.

Theater Missile. Ballistic missiles, air to surface guided missiles, and air, land and sea launched cruise missiles whose target is within a given geographic theater outside of the contiguous United States.

Theater Missile Defense Systems. The physical Army, Navy, Air Force and Marine Corps battlefield systems which support passive and active missile defense measures, provide attack capabilities, and establish and maintain the BMC4I network.

Assumptions

The first assumption was that missile defense and air defense, while similar and related are not the same. Assumptions made in the past

about fighting an air defense threat may not be valid against a missile threat.

The second assumption was that the threat from theater missiles will play an increasingly greater role in the CINC's formulation of strategy and operational planning.

The third assumption was that unwritten doctrine or gentlemen's agreements between CINCs and the services on command and control of active defense may exist but does not obviate the need for this study and the formulation of more formal doctrine.

Background

The Current Threat

The importance of developing a comprehensive program to counter TBMs cannot be overemphasized. Modern ballistic missiles have been in use since World War Two.[17] Since 1973, they have been used globally in six regional conflicts.[18] With twenty-two nations in possession of ballistic missiles and other nations seeking to acquire or develop them, military threats to regional stability are rapidly increasing worldwide.

Additionally, the apparent success of Tomahawk cruise missiles during Desert Storm is likely to foster a surge in cruise missile development and acquisition programs in many nations. These same nations might also be able to buy technology, hardware, or complete systems from other countries. This increases the global missile threat because cruise missiles may be

> even less expensive and more accurate than ballistic missiles, and their smaller size may make them an even more elusive target for counter-force operations. Furthermore, they may also be more difficult to defend against than manned aircraft because of their lower radar cross-sections… Even unsophisticated unpiloted aerodynamic vehicles or cruise missiles could be configured to accomplish a variety of missions. Such aerodynamic vehicles are widely available, inexpensive (to purchase, support, and operate,

> small, mobile, easy to hide, capable of being launched from a variety of launch platforms; air, ground, ship, or submarine without significant modifications to the missile, potentially hard to detect in-flight, and with global positioning systems (GPS) accurate to a few tens of meters.[19]

Coupled with active research and programs for development of weapons of mass destruction (WMD) in over two-thirds of these same countries, the threat posed by missiles will be even greater and is not only military in nature, but also political.[20]

Nations capable of deploying tactical missiles need not possess great numbers of them to have a significant political impact. The mere existence or threat of use of a particular missile may cause drastic changes in the regional security situation or may allow the missile-owning nation or group to achieve regional political goals at relatively little cost. Nations allied with or friendly to the U.S. will, in the future, be increasingly vulnerable to missile attack from neighboring belligerent states or regions.

Transnational Threats

It is important to realize that threats from tactical missiles are no longer isolated to operations in which national armies or organized armed services are involved. The U.S. and allied military forces continue to accept an increasingly larger burden of nontraditional missions such as peacekeeping, peace enforcement, counter narcotics and counter terrorist operations.

While at one time the threat to forces deployed on these operations was limited to relatively primitive conventional weapons systems, future deployments may see a rise in the presence and use of tactical missiles from nontraditional enemies. Terrorist groups, insurgents, opposing factions in civil wars, and members of organized criminal groups may become increasingly involved in the acquisition of missiles and missile technology.[21]

The potential for these groups to obtain, use, or sell missile and WMD technology has greatly increased over the last few years, particularly from within the former Soviet Union where decentralized control has left large windows of opportunity for would-be weapons merchants. Because these groups are able to evade or defy recognized export controls and nonproliferation regimes, they are difficult to track and control. While it is unlikely that U.S. interests would be directly targeted by any of these groups in the near-term, U.S. forces deployed on missions where these groups operate could face an expanded threat from coincidental or even deliberate attack.[22]

The Future Threat

Current trends in missile technology proliferation give some indication that tactical missiles will increasingly be deployed in future wars. Programs in most countries researching or developing missiles aim at increasing the range and accuracy of systems while reducing the costs. While advanced nations will continue to work on smaller, more accurate, more sophisticated missile systems, a greater threat may come from less sophisticated, cheaply built, but unexpected sources. Used in great numbers, even unsophisticated missiles could overwhelm current active defense systems.

Easy access to global positioning system (GPS) and other advanced technologies makes developing and building an accurate indigenous missile a far easier and cheaper proposition than might be imagined. Also, nations or groups may increasingly adapt other systems for use as missiles. According to the DoD, unmanned aerial vehicles (UAVs) for the delivery of insecticides are widely available and can be adapted for use as cruise missiles for the delivery of chemical or biological agents.

Also, surface-to-air missiles (SAMs) can be adapted for use as single-purpose ballistic missiles with relatively little effort or cost.[23]

Furthermore, the threat to anti-missile defenses themselves will likely increase. The DoD explains:

> While technological aspects of developing ballistic missiles are challenging, they are well and widely known. As more nations begin deploying ballistic missile defenses, their adversaries will likely begin developing countermeasures to these defenses, which need not be expensive or involve high technology.[24]

Advances in technology will continue to drive the missile threat, allowing more nations the opportunity to develop or purchase more sophisticated, less-expensive missile systems. Knowing where they are or how they will be doctrinally deployed may be helpful, but may not always be possible. Again, a short passage from DoD's *Proliferation: Threat and Response* illuminates this point:

> No one writing ten years ago would have had the foresight to predict the end of the Cold War or the Gulf War. In an uncertain world, all potential antagonisms cannot be forecast. Hence, some planning and investments cannot be adversary-specific and must instead address the types of threats that are enabled by the availability of relevant, state-of-the-art technologies.[25]

Today's state of the art will be outdated technology tomorrow. Research and development initiatives are balanced between meeting the immediate and growing threat from short-range theater ballistic missiles and expanding capabilities to defend against missiles of future.

While systems have evolved in the face of clearly defined threats and are preparing to meet less well-defined future threats, doctrine for active defense of TBM has evolved from joint theater air defense doctrine with no recognition of the possibility that air defense and missile defense, though related, are not necessarily two identical and mutually interchangeable concepts.

Some agreements may already exist between CINCs and service chiefs as to how and under what command and control structure their systems

will be employed. Joint doctrine is often left open to interpretation by the CINCs and the services which can cause confusion, inter-service rivalry and budget battles that are counter-productive to the overarching doctrine, deter and fight. This thesis investigates the possibility that clearly defined doctrine for active defense command and control could be established for the betterment of the JTMD, the Army, and the joint force environment.

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[1] James J. Cravens, "A New Approach to Theater Missile Defense," Army, (July 1995), 19-20.

[2] "Patriot: Guarding World Peace," (US: Raytheon Company Report, 1995), 3.

[3] "U.S. Ballistic Missile Defense Programs," (Washington DC: US Department of Defense Office of External Affairs, October 1994), 1.

[4] LTC Charles A. Anderson and COL Richard G. Kurtz, "Air and Missile Defense: Who's in Charge?" Air Defense Artillery, (El Paso: U.S. Army Air Defense Center and School, July-August 1996), 2.

[5] Ibid., Xi.

[6] Ibid., Xi.

[7] FM 100-12, US Army Theater Missile Defense Operations (Coordinating Draft), (Ft Monroe: TRADOC, 1996), 2-10.

[8] Ibid., 2-11.

[9] Director for Operational Plans and Interoperability, Joint Publication 1-02, Unified Action Armed Forces, (Washington DC: Department of Defense, February, 1995), GL-1.

[10] Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, (Washington DC: Department of Defense, February 1996), 1-3.

[11] BMDO Glossary Version 2.0, (Washington DC: BMDO), 1997, 1.

[12] Ibid., 1.

[13] Director for Operational Plans and Interoperability, Joint Publication 1-02, Unified Action Armed Forces, (Washington DC: Department of Defense, February, 1995) .

[14] Ibid., Pg. Xi.

[15] Daniel T. Kuehl and Charles E. Miller, "Roles, Missions, and Functions: Terms of Debate," Joint Forces Quarterly, (Washington DC: National Defense University Press, Summer 1994), 103.

[16] Director for Operational Plans and Interoperability, Joint Publication 1-02, Unified Action Armed Forces, (Washington DC: Department of Defense, February, 1995) GL-7.

[17] On 12 June, 1942 the first ten V-1 "flying bombs" pounded into English soil. Before the end of the war, thousands of V-1s and V-2s would rain down on the English, striking terror into the British people and reducing British morale both at home and with forces deployed.

[18] Director for Operational Plans and Interoperability, Joint Publication 1-02, Unified Action Armed Forces, (Washington DC: Department of Defense, February, 1995. 52.

[19] Ibid. A-8.

[20] Ibid. A-7.

[21] "Proliferation, Threat and Response," (Washington DC: Office of the Secretary of Defense, April, 1996), 43-5.

[22] Ibid., 45.

[23] Ibid., A-10.

[24] Ibid., A-7.

[25] Ibid., A-12.

CHAPTER TWO

LITERATURE REVIEW

> We received a report that a Scud fired at Dharan had struck a U.S. barracks. The explosion killed twenty-eight of our troops and wounded many more. It was a terrible tragedy-this terror weapon launched into the sky that by sheer fate happened to fall where we had a concentration of troops-and it brought home once again to our side the profanity of war. I was sick at heart.[1]
>
> General H. Norman Schwarzkopf,
> Joint Publication 3-01.5

Introduction

Since Desert Storm, the armed services have worked to develop and field systems to combat tactical ballistic missiles, but little has been written on how these various systems would or should be employed, controlled, and coordinated. The primary research question in this thesis is: Who should control active defenses against ballistic and cruise missiles?

While there is an abundance of technical information on the status. of missile defense system developments, and a wealth of historical information on roles, functions, missions, and joint doctrine in general, few writers have attempted to go beyond interservice rivalry and debates over budget to suggest how TBM defenses will fit into the theater commander's force structure.

In order to understand the environment in which command and control doctrine for an active defense would function, it was first

necessary to review the literature that discussed the theater missile threat and then to review what historical information and doctrinal writings and discussion were extant.

Most of the literature was found in the Combined Arms Research Library and archives at Fort Leavenworth, Kansas, and through searches on the internet. It also includes information gathered from the DOD, the Departments and subordinate organizations of the Army, Navy, and Air Force, active defense system manufacturers and internet and Congressional news services.

The doctrinal literature was so new in many cases that there was little commentary on it outside of the services. In some cases, the only written doctrine available was still in the coordinating draft stage.

The Initial Threat

Desert Storm was the first large-scale battle laboratory for testing U.S. attack operations and active defenses against TBMs. It clearly showed the nature and scope of tactical missile threats to U.S. forces deployed in current operations and suggested the seriousness of threats which could evolve for use against future U.S. operations. During the forty-three days of the war, Iraq launched a total of eighty-six Scud or modified Scud ballistic missiles at targets in Israel and Saudi Arabia. This forced the Allied Coalition to dedicate an abundance of time and attention to Scud missiles.

Since the war, assessments of the actual damage these missiles could have done have shown that they would have had relatively little

military impact on the operation.[2] The destructive power of their warheads was small, and the accuracy of their guidance systems was limited. Iraq's sporadic firing of single or relatively few missiles at any one time facilitated the active defense efforts of the coalition, making it possible to engage most of the incoming missiles with a relatively small number of deployed defense systems.

These facts, however do not frame the very real threat that Iraqi missiles posed. Their use as terror weapons, the prominence they played in the media, and the threat they posed to the viability of the Allied Coalition forced the U.S. and its allies to concentrate efforts to identify, locate and destroy them. This was not an easy task.

Attack operations, the tasks involved in finding and destroying TBMs, take time and resources from other campaign efforts, while the failure to find or destroy them can have political repercussions. Throughout the conduct of the air campaign in Desert Storm and well into the ground campaign, elements of coalition air forces were kept busy trying to locate and kill Scud transporter-erector-launchers (TELs). Every air sortie generated against the Scud threat pulled resources away from other targets. This fact may have delayed the start of the ground war, given U.S. and coalition concerns for a thorough air preparation of Iraqi military units and infrastructure.

Aware that they could not possibly find and destroy all of Saddam's Scud launchers before missiles were launched, the U.S. decided to deploy the only active defense system available; Patriot. Patriot battalions were requested by the joint force commander, recommended by

State Department, and flown at high priority from units stationed both in the U.S. and overseas to Turkey, Israel and Saudi Arabia.

Patriot missiles served not only as a military defense against Scud missiles but also as an instrument of diplomacy. If it were not for the presence of the Patriot systems and the peace of mind that accompanied them to Israel, Tel Aviv may not have stayed out of the war. Israel's military involvement would assuredly have threatened if not destroyed the fragile Allied Coalition. While the coalition remained viable, so did the threat of Iraqi missile attack. BMDO's Lessons From the Persian Gulf War explains:

> Traditional notions of deterrence may not always apply in regional conflict situations. Instead of being deterred by the possibility of Israeli retaliation against Scud attacks, Saddam sought to provoke such a response, luring Israel into the conflict to change the political dynamics of the war. In this type of situation, the presence of defenses can be decisive in avoiding escalation.[3]

Finding TBMs: The Needle in the Haystack

Despite the vast array of weapons and technology that the coalition brought to bear against Iraq's limited Scud capabilities, many of Saddam's missiles were left untouched. Twenty-eight American servicemen were killed in Dharan when a Scud landed on the barracks where they were sleeping. By the end of the war it was learned that the Patriot system did not have the great success rate that had been supposed despite the 158 Patriot missiles fired, nor had the coalition been able to find and destroy all of the Scud TELs.

There is evidence to indicate that some TELs reported destroyed were in fact never damaged.[4] Future adversaries will have learned how difficult it is to find and destroy TELs and will likely work to employ them in even greater numbers than Iraq did in 1990-91. Accordingly, not only must the U.S. seek to improve its detection and attack

capabilities, but must also continue expanding its suite of active defense systems.

Even with the vast efforts of the allies during Desert Storm and the United Nations inspection teams since the end of the war, Iraq may maintain a viable missile capability. While any predictions about the future are bound by nature to be dubious, it seems reasonable to assume that attack operations against TBMs in future wars will meet with similarly limited rather than total success.

This assumption justifies and promotes the establishment and maintenance of a robust active missile defense and therewith, the creation of suitable doctrine for its deployment. As poorly as the U.S. did against Iraq, it can expect no easier threat in the future. In "Proliferation: Threat and Response," the U.S. DOD anticipates that in the future:

> States with more launch capability than demonstrated by Iraq during the Gulf War will launch large scale salvo attacks against high priority targets, with smaller numbers of missiles being directed against targets of opportunity. Salvo attacks maximize damage and compensate for the inaccuracy of older technology missiles.[5]

Just how widespread the threat has become or is likely to become remains a central issue of the discussion.

Doctrinal Literature

When a volleyball comes over the net, the player most able to set it up for return will call it. Once a player calls the ball he is responsible for its future path, either returning it or directing it to another player. The rules are clear. It can be hit three times, but if it fails to return over the net or if it touches the ground, the ball is lost and the game continues with another serve.

Similarly, when a missile is fired it would seem that the system most able to bring it down would call it and be responsible for controlling the play against it. However, even though the stakes in the missile defense game are high, the rules (doctrine) remain unclear and in debate, and all of the players (the services) are claiming simultaneous responsibility for calling the shots. The main thesis question centers on this doctrinal problem.

Because of the complexity of war; roles, missions, and functions often overlap and intertwine. According to strategic studies scholars Kuehl and Miller, this complexity is:

> exacerbated by lines of authority which are not as clean as commonly believed. Congress assigns roles in the respective arenas of war while the executive branch assigns detailed functions and authorizes the development of forces to carry them out… Services develop forces but do not employ them, while combatant commands, under joint doctrine, employ forces but do not develop them. To make matters worse, the services then overlay this process with their unique doctrines, and when services allude to missions they are almost always referring to their doctrinal missions, not to those of combatant commands.[6]

Each time a new technology or arena of warfare emerges that has not been previously allocated to a specific service, a functional void is created. The natural tendency is for each of the services to move towards filling the void and directly adding new functions and indirectly providing new justifications for existence. This seems to be the case in JTMD.

Ballistic Missile Defense Organization (BMDO)

The BMDO, concerned about the immediate and growing threat from TBMs, assigns the highest priority to development and deployment of theater missile defenses. National missile defense and advanced technology programs rank in priority behind upgrades to current TMD

systems. While there are many reports on budget allocation and resource apportionment, no evidence of BMDO commentary on command and control doctrine could be found.

The BMDO has instituted the CINC's TMD assessment program to enhance communications between the system developers (BMDO) and the system users (the CINCs). Originally an Army TMD assessment program designed to help the U.S. European Command plan and exercise missile defenses, the CINCs' TMD assessment program brings hardware and doctrine developers together with representatives from the CINCs on an annual basis. Despite this new development, written doctrine does not seem to be forthcoming.[7]

Joint Doctrine

Joint Publication 1, the Joint Warfare of the Armed Forces of the U.S., provides broad doctrinal guidelines and principles for the joint commander to employ during operational planning and execution. While it leans heavily toward concepts and generalities in most areas, it is quite clear on the basic nature of jointness:

> The nature of modern warfare demands that we fight as a team. This does not mean that all forces will be equally represented in each operation. Joint force commanders choose the capabilities they need from the air, land, sea, space, and special operations forces at their disposal. The resulting team provides joint force commanders the ability to apply overwhelming force from different dimensions and directions to shock, disrupt, and defeat opponents. Effectively integrated joint forces expose no weak points or seams to enemy action, while they rapidly and efficiently find and attack enemy weak points. Joint warfare is essential to victory.[8]

The most important factor in this doctrinal snapshot is that joint force commanders choose the capabilities they need from the forces at their disposal and employ them doctrinally to complete their assigned missions. As environments, situations and threats change, so too will the forces that the JFC employs. In order to allow him maximum flexibility and efficiency in designing and planning operations for JTMD

active defense, he must have clear JTMD doctrine and be given a range of capabilities and systems from which to choose.

Joint Theater Missile Defense Doctrine

As written in Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, the command and control relationships for active defense seem to be relatively clear. The geographic combatant commander is responsible for establishing theater guidance and objectives for JTMD and for assigning and apportioning forces and resources. JTMD plans and operations are integrated at theater level under the supervision of the geographic combatant commander and documented in the appropriate operation plans and annexes.

The JFC establishes guidance and objectives for JTMD within his area of operations and defines and implements a methodology for TMD activities. This guidance is published in appropriate joint planning operation plans and annexes and monitored by the joint force staff. Component commanders jointly conduct operations under the guidance and in support of the objectives of the JFC. JTMD considerations and objectives are outlined in the JFC's concept of the operation.[9]

Active Defense

Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, dated February 1996 vests overall responsibility for active defense TMD in the area air defense coordinator (AADC), who is usually the joint force air component commander (JFACC). The AADC/JFACC:

> assists the joint force commander (JFC) in determining missions, communications priorities, and rules of engagement for active defense forces based on assessment and prioritization of forces, critical assets, and population centers to protect. Active defense forces are under the operational control of their component commanders, who employ these forces under the weapons control procedures and measures established by the AADC and approved by the JFC.[10]

U.S. Army

The coordinating draft of FM 100-12, "U.S. Army Theater Missile Defense Operations," discusses how the Army, as a force provider will establish coordination with the joint force commander. According to this manual, planning for missile defense is conducted by the Air and Missile Defense Command and their supported headquarters. The Army will establish an Army Theater Missile Defense Element (ATDME) to provide the JFC and ARFOR commanders the ability to exercise control of Army theater missile defense assets. The ATMDE would have linkages to every unit involved in JTMD and would provide the JFC with a central nexus for Army attack operations and for active and passive defense.

Army doctrine recognizes the existence of other service capabilities and the importance to link closely with them to provide complete theater coverage. It establishes a theater army air defense coordinator (TAADCOORD) to ensure that Army air and missile defense is coordinated with joint active defense operations and planning at the theater level.

U.S. Navy

Naval Doctrine Publication 1, Naval Warfare, dated March 1994, discusses the role and missions of the Navy. According to naval doctrine, the Navy promotes and defends U.S. national interests by maintaining maritime superiority, contributing to regional stability, conducting operations on and from the sea, seizing or defending advanced naval bases, and conducting land operations that are essential to the prosecution of naval campaigns. It accomplishes these roles through "deterrence operations and specific peacetime operations, while maintaining warfighting readiness through continued forward deployed presence, exercising a robust sealift capability, and developing interoperability" with the other services.[11]

The Navy contributed multimission Aegis warships to the JTMD resources of the Allied Coalition during the Gulf War, providing a capability similar to that of the Army's Patriot system. Since the war, the Navy has continued to "carve itself a major new role in the theater missile defense arena," with two major initiatives.[12]

The first includes upgrades to capabilities inherent in the Aegis radar and weapon control system and standard missile combination on the Ticonderoga-class cruiser and Arleigh Burke-class destroyer. This "lower tier" system provides a TBMD capability (similar to the Patriot PAC-3) from the sea in support of forces that may have to fight their way into theater.

The second is a future advanced concept or upper tier that would provide extensive theater-wide protection from the sea, intercepting missiles outside the atmosphere as well as in the ascent and descent phases of the missile's flight. This capability would allow the Navy to extend an umbrella of protection over a theater of operations until such time as ground or air-based systems could deploy.[13]

The late Admiral Mike Boorda, when he was Chief of Naval Operations, summarized the importance of the Navy to the JTMD team. He said:

> If you believe that tactical ballistic missiles are going to become more accurate and more lethal with longer range, and you know that our strategy is to move forces to a conflict area rapidly through airlift and sealift, how do you get the forces ashore if you can't protect the airfields and the ports, and you also need those airfields and ports to get ground TMD systems in the vicinity? You can't get there without a sea-based system. I think the navy offers a capability that nobody else can offer, but in the end you've got to have (Army TMD) systems on the ground as well. It's going to be a combination of systems that solves the (TMD) problem. It's not going to be any one system or any one service.[14]

U.S. Air Force

The Air Force exists to fight in the air. More specifically, and according to Air Force Manual 1-1, Basic Aerospace Doctrine of the U.S.

Air Force, it serves to conduct sustained combat operations in the air, to defend the U.S. against air attack, to gain and maintain general air supremacy, to defeat enemy air forces, to conduct space operations, to control vital air areas, and to establish local air superiority where necessary. As a corollary to its overall function as a service, it provides forces for appropriate "air and missile defense and space control operations, including the provision of forces as required for the strategic defense of the U.S., in accordance with joint doctrines."[15]

General Ronald R. Fogleman, chief of staff of the U.S. Air Force, wrote a critical article on TBMD in 1995 that related the Desert Storm experience to the future need for TBM defenses. In this article he lamented the funding levels given to the Army and Navy to develop "catcher's mitt" systems at the expense of longer-range (air force) systems.[16]

Air Force systems, he believes, would attack launchers and intercept ballistic missiles during their vulnerable boost phase. He accurately describes the need for an array of systems which detect, locate, and destroy TELs and missile launches at their point of origin, as well as systems which destroy missiles during the boost phase where possible, but he postpones discussion of command, control and integration of independent systems in a joint environment:

> The Air Force is seriously pursuing its charter to work with the other services to develop a theater-adaptable, jointly integrated theater air defense BMC4I system. As executive agent, we will integrate existing architectures and develop future ones that provide war-fighting CINCs a flexible, seamless command and control system.[17]

Summary

Outside of doctrinal publications, many of which were written as recently as 1996, and several editorial commentaries on specific service capabilities to meet the TBM threat, there has been little written on

TMD command and control. Collectively, the bulk of literature addressed in only general terms the way in which active defense forces would be commanded, coordinated, and controlled. This lack of literature supports the first hypothesis that doctrine for command and control of active defenses against theater missiles remains unclear and open to unnecessary and counterproductive interpretation by the services.

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[1] Norman H. Schwarzkopf, Joint Pub 3-01.5, Joint Publication for Theater Missile Defense, (Washington, DC: Department of Defense, February, 1996), 1-1.

[2] Michael W. Ellis and Jeffery Record, "Theater Ballistic Missile Defense and U.S. Contingency Operations," in Parameters, XXII, (Carlisle: U.S. Army War College, Spring 1992), 11.

[3] "U.S. Ballistic Missile Defense Programs," (Washington DC: U.S. Department of Defense Office of External Affairs, October 1994), 1.

[4] Michael W. Ellis and Jeffery Record, "Theater Ballistic Missile Defense and U.S. Contingency Operations," Parameters, Vol. XXII, No.1, (Carlisle: U.S. Army War College, Spring 1992), 11.

[5] "Proliferation, Threat and Response," (Washington DC: Office of the Secretary of Defense, April, 1996), A-7.

[6] Daniel T. Kuehl and Charles E. Miller, "Roles, Missions and Functions: Terms of Debate," Joint Forces Quarterly, (Washington, DC: National Defense University Press, Summer, 1994), 105-9.

[7] BMDO Fact Sheet 96-014, The Commander in Chiefs' Theater Missile Defense Assessment Program, (Washington, DC: BMDO, February 1996), 1.

[8] Joint Publication 1, Joint Warfare of the Armed Forces of the U.S., (Washington, DC: Department of Defense, January, 1995), i.

[9] Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, (Washington DC: Department of Defense, February 1996), II-1.

[10] Ibid., xi.

[11] Naval Doctrine Publication 1, Naval Warfare, (Washington, DC: U.S. Navy, March 1994), 21.

[12] Glenn W. Goodman, Jr. "Unfurling a Leakproof Umbrella: Navy Theater Ballistic Missile Defense's Time Has Come," Armed Forces Journal, (April 1995), 22.

[13] "U.S. Ballistic Missile Defense Programs," (Washington, DC: U.S. Department of Defense Office of External Affairs, October 1994), 4.

[14] Admiral Michael Boorda, Chief of Naval Operations, as quoted in "Unfurling a leakproof Umbrella: Navy Theater Ballistic Missile

Defense's Time Has Come," in Armed Forces Journal International, (Washington, DC: AFJI, April 1995), 23.

[15] Air Force Manual 1-1, Basic Aerospace Doctrine for the U.S. Air Force, (Washington, DC: Department of the Air Force, March 1992), 37-8.

[16] Ronald R. Fogleman, "Theater Ballistic Missile Defense," Joint Forces Quarterly, (Washington, DC: U.S. Government Printing Office, Autumn, 1995), 76.

[17] Ibid., 79.

CHAPTER THREE

RESEARCH METHODOLOGY

> Uncertainty over roles and missions and decades-old bureaucratic jockeying for position is probably inevitable; perhaps the problem is that technology has outstripped the ability of existing organizations to effectively enfold new technologies. With the turn of the century new and evolving arenas are influencing not only how forces are organized, trained, and equipped, but also their very missions.[1]
>
> Daniel T. Kuehl and Charles E. Miller, Joint Forces Quarterly

Who should control active defenses against ballistic and cruise missiles? To explore this question and find a satisfactory answer, several research methods including historical, comparative, and descriptive were combined.

The research began with a historical review of the threat that drove the emergence and continued expansion of active defense systems and doctrine. It then explored the systems designed to meet the threat in the past and briefly looked at systems under development. A review and comparison of doctrines from BMDO, the Joint Staff, and the services was then conducted along with an exploration of the debate (or lack thereof) in literature. Also, a brief review of terms of reference that frame service responsibilities and priorities, namely--roles, missions and functions--was conducted.

An analysis was then conducted which compared the existing TMD active defense command and control doctrines and associated literature against each other and against the overarching joint doctrine. The comparison considered threat, mission, and capability to determine the

efficacy of each doctrine in comparison with the others. Additionally, a comparison was made between the threat paradigm against which traditional joint theater air defense doctrine was devised and the threat paradigm facing JTMD.

Moreover, active defense doctrine was compared to other similar aspects of joint doctrine to determine if commonalties or dichotomies were present which might suggest a need or lack of need for change. Finally, the historical information and doctrinal research and analysis were tied together and examined for possible answers to the research question, and recommendations were crafted. After the research was complete, and before the analysis began, a close accounting was made of areas needing further study and problems that presented themselves during research.

Historical Review

The historical review of threat and response was instrumental in understanding the nature of the environment in which active defense doctrine had and would continue to evolve. It was helpful in validating the research question and elucidating the significance of the thesis. Was there and is there a need for defense against theater missiles? It also served to validate the second assumption: that the threat from theater missiles will play an increasingly greater role in the CINC's formulation of strategy and operational planning.

Saddam Hussein's use of Scud missiles during Desert Storm was not a new phenomenon. The Allied Coalition's capability to respond was a historical first and set the precedent for the development of missile defense doctrine. It was a logical starting place for an investigation into a newly emerging field and provided a point of departure for the analytical discussion and debate.

It was also necessary to examine the air and missile threats in order to make the comparison between old and new threat paradigms. Systems had evolved to meet threats and doctrine had evolved or was evolving to drive the systems. An understanding of the former was required to move to an understanding of the latter.

System Evolution

A brief look into the development of active defense systems was necessary to determine the scope and importance of the doctrinal debate. How was the Department of Defense allocating budgets for development and fielding of active defense systems? What priorities had been set, if any, for program budget allocations, future developments or system fielding? To what extent were the services involved in JTMD? These questions might point to a future direction for TBMD and for the evolution of active defense doctrine.

Major differences observed in concept, characteristics, or design of service active defense systems might help explain the nature of differences, if present, in their doctrines. In general terms, how were the services' active defense systems similar or different? In what ways were their active defense doctrines, if they been written, an extension of the physical capabilities their systems possessed? In what ways were the doctrines similar or different?

Doctrinal Review and Comparison

The first subproblem to the thesis question- to identify, analyze and interpret the existing joint and service doctrine on command and control aspects of active defenses against ballistic and cruise missiles required a doctrinal review. This review established a frame of

reference for the debate and provided a point of departure for the comparison and analysis.

In specific, a review and comparison of doctrines from BMDO, the Joint Staff, and the services, as well as an exploration of the unclassified commentary and literature was conducted. What was the joint doctrine? What was the doctrine of the separate services? How were their missile defense doctrines similar or different, complimentary or contradictory?

Active defense doctrine was compared to other similar aspects of joint doctrine to determine a need or lack of need for change. This review and comparison enabled a test of the first hypothesis- that doctrine for command and control of active defenses against theater missiles remained unclear and open to unnecessary and counterproductive interpretation by the services. Had existing doctrine been used as a model for anti-missile doctrine? How had active defense doctrine evolved, if at all? Was there clear doctrinal guidance or was the debate focused merely around roles, missions and budgets? Was the doctrine sufficient?

The research conducted to address the second subproblem- to identify, analyze and interpret historical aspects of the evolution of current joint command and control doctrine that might be illustrative to the main problem statement was more subjective. It culled from other aspects of the research those significant points that might be helpful in illuminating the debate or providing possible answers. Because of its subjectivity however, it played less of a role in the final comparison and analysis.

Strengths and Weaknesses

The methods chosen for this research were inherently subjective in nature. This was both a strength and a weakness. Because TBMD is a relatively new field, little historical data existed to support discussion of doctrinal development specific to active defense. The combinatory approach allowed the historical facts to speak for themselves when present and provided the opening for critical analysis and comparison in areas where historical facts were lacking or unavailable.

The subjective choice of including specific aspects of command and control doctrine in the research while dismissing other aspects however, could have introduced unforeseeable and unnecessary bias into the framework of the debate. Wherever possible, all pertinent aspects were considered for review even if they eventually proved to be less than useful in the analysis.

Also, because some of the debate centered around functions and missions of the services, the natural tendency towards parochialism could have threatened the integrity of this analysis. Those few authors who have entered the doctrinal debate were most often representing their service at the time. The source and context of those authors was considered and addressed where possible.

Great effort was taken to remain objective, to allow the facts to stand alone, and to analyze the information gathered in as unbiased a manner as possible. At the same time, the relative paucity of historical debate on the subject made any discussion valuable to the thesis and the overall doctrinal debate.

Summary

This combination of exploratory and cognitive methods provided a logical framework for the research and analysis required to complete the

thesis. Historical information and doctrinal research and analysis were tied together and examined for possible answers to the research question, and recommendations were crafted. Comparing the similarities and differences in doctrines against the threats, missions and capabilities enabled a depth of understanding sufficient to develop the conclusions and recommendations.

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[1] Daniel T. Kuehl and Charles E. Miller, "Roles, Missions and Functions: Terms of Debate," Joint Forces Quarterly, (Washington, DC: National Defense University Press, Summer, 1994), 105-109.

CHAPTER FOUR

ANALYSIS AND DISCUSSION

> The key to the concept is simple: centralized planning and decentralized execution. The basic requirement of decentralized operations in general war is pre-planned response in accordance with commonly understood doctrine. Lord Nelson did not win at Trafalgar because he had a great plan, although his plan was great. He won because his subordinate commanders thoroughly understood that plan and their place in it well in advance of planned execution. You must be prepared to take action when certain conditions are met; you cannot anticipate minute-by-minute guidance.[1]
>
> Vice Admiral Henry C. Mustin III, Joint Publication 1, Joint Warfare of the Armed Forces of the U.S.

Introduction

This chapter further describes the theater missile threat and reviews the active defense systems currently in service as well as those in design or under development. It clarifies the service responsibilities and priorities according to U.S. law and Joint doctrine. It then examines and compares active defense doctrine from the BMDO, the Joint Staff, and the services and discusses the issues covered or not covered by the debate in literature.

It then compares the existing TMD active defense command and control doctrines and associated literature against each other and against the overarching joint doctrine. The comparison considers threat, mission, and capability to determine the efficacy of each doctrine in comparison with the others. Additionally, it examines the similarities and differences between the threat paradigm against which

traditional joint theater air defense doctrine was devised and the threat paradigm facing JTMD. Active defense doctrine is then compared to other similar aspects of joint doctrine and commonalties and dichotomies are discussed.

Finally, the historical information and doctrinal discussion and analysis are tied together to answer the research question: Who should control active defenses against ballistic and cruise missiles?

Refinement and Discussion of the Threat

The general historical review of theater missile threats reviewed thus far was instrumental in delineating the environment in which active defense systems and doctrine had and will continue to evolve. It was, as has been noted, helpful in validating the research question and elucidating the significance of the thesis. It also served to validate the second assumption: that the threat from theater missiles is growing and will therefore play an increasingly greater role in the CINC's formulation of strategy and operational planning.

It was not difficult to find facts that would substantiate this assumption. As noted earlier, twenty-two nations now possess ballistic missiles with ranges beyond one hundred kilometers. Seven of those nations also have missiles with ranges in excess of one thousand kilometers. Advances in technology and increased global information sharing will continue to make cruise missiles easier and less expensive to build and acquire.[2] Likewise, air-to-surface missile technology will continue to become more accessible, advanced, and lethal. But beyond general descriptions of theater missiles, what exactly are they?

In order to fully understand the theater missile threat, it is necessary to further refine the definition and discussion of theater missiles. Chapter one defined theater missiles as ballistic, cruise and

air-to-surface missiles used in a given theater of operations outside of the United States. While this is the doctrinal definition given in Joint Pub 3-01.5, Doctrine for Joint Theater Missile Defense, it is not descriptive enough to define the characteristics of the various missiles in the threat set.

What differentiates a ballistic missile from a cruise missile for example? How is an air-to-surface missile similar to or different from other missiles? And in what ways do any theater missiles resemble traditional threats from enemy fast-moving, air-breathing aircraft? Answers to these questions are useful in comparing the old aircraft threat paradigm with the new aircraft and missile threat paradigm. This was necessary to validate the first assumption: that missile defense and air defense, while similar and related are not the same.

If missile characteristics are markedly different from aircraft to the extent that they change the nature of the air defense threat, assumptions made in the past about fighting aircraft may not be valid against fighting missiles. Refining the missile definitions now is also helpful later in understanding how active defenses detect, acquire and fight theater missiles.

Ballistic Missiles

The BMDO glossary defines a ballistic missile as any missile that does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated. While some adjustments can be made to the trajectory by additional thrust and/or guidance mechanisms, most ballistic missiles currently in service continue to fly along a predetermined trajectory.

Army FM 100-12, US Army Theater Missile Defense Operations further defines theater ballistic missiles as those weapons systems limited by range to operate within a theater of operations. Theater ballistic

missiles can be subdivided into several types by range: short-range ballistic missiles (SRBM)--thirty to one thousand kilometers, medium-range ballistic missiles (MRBM)—one thousand to three thousand kilometers, and intermediate-range ballistic missiles (IRBM)—three thousand to five thousand kilometers.

Intercontinental ballistic missiles (ICBM)--over five thousand, five hundred kilometers and submarine-launched ballistic missiles (SLBM) are not normally considered theater missiles and are usually included in discussions of national missile defense.

Ballistic missiles offer several advantages over manned aircraft. They are less expensive to acquire and maintain than a modern air force. Training requirements for missile launch crews are easier and cheaper than for pilots and aircraft maintenance personnel. Also, ballistic missiles' high mobility and relatively limited support structure make them far less vulnerable to attack operations than manned aircraft which must return to fixed air bases.

The most significant advantage they offer is related to the extremely limited defense capabilities of most nations to protect against them once launched. Currently, their are no active defense systems capable of providing effective theater-wide protection from ballistic missiles. Programs under development will be discussed in a later section of this chapter.

Cruise Missiles

Cruise missiles were defined in chapter one as unmanned, powered, typically self-guided vehicles that fly at one or more predetermined constant (cruise) altitudes and carry a lethal payload. They differ from ballistic missiles in that their course, while preplanned, does not often follow the straightest path from launch to target. Cruise missiles can maneuver in altitude and heading to avoid detection and

follow predetermined terrain contours. This increases their survivability and their value for use in surprise attacks during the opening phases of a campaign.

Their ability to be launched from land, sea or air gives the enemy commander more options for launch location and direction of attack and their low-level flight profile and low-observable characteristics make them difficult to acquire and track. Probability of detection is decreased by minimizing radar cross section and infrared signatures. This is accomplished by decreasing the physical size of the missile, by using miniaturization of components and subsystems and by constructing the missile body of radar absorbing materials. Additionally, the relatively small turbojet or turbofan propulsion system reduces the infrared signature and consequent detectability.

Cruise missiles are also typically characterized by long-range and deadly accuracy. Ranges of cruise missiles can vary between 50 and 2500 kilometers and can deliver a variety of warheads with the same or better accuracy than previously achieved by manned aircraft. This limits the risk to aircrews and aircraft and makes cruise missiles an attractive option for employment against high-value targets where defenses are likely to be concentrated.

Of all the theater missiles, cruise missiles most resemble air-breathing aircraft. Despite the fact that they are smaller and more difficult to detect and track than aircraft they typically fly at similar speeds and hence present themselves for engagement for a similar time duration. The longer the range of the cruise missile and the slower it flies, the more opportunities for engagement that will be presented.

Tactical Air-to-Surface Missiles

Tactical air-to-surface missiles (TASM) are launched from aircraft against ground targets. Their high speed and small radar cross-section make them difficult to detect, tract and engage. They have impact velocities ranging from 500 to 1500 miles per hour and can engage targets at ranges up to 150 kilometers.

TASMs employ command guidance, semiactive laser, electro-optical and antiradiation homing seekers. With laser guidance, the missile locates a target illuminated by a laser source originating from the delivery aircraft, a designating aircraft, or a ground designator. Electro-optical seeking, both television and imaging infrared radar (IIR), allows the TASM to guide itself to the target once the pilot has "locked-on." IIR gives day, night, and adverse weather engagement capability to the TASM. Finally, passive radar homing allows anti-radiation missiles to detect enemy radars and home on the radar emissions.

TASMs are incredibly difficult to detect, track and destroy. Current active defense systems have only a limited capability to successfully engage a TASM. For this reason, counter-air operations aim to destroy TASM platforms (aircraft) at extended ranges before they can come within range of friendly systems.

Aircraft Threats

Counterair targets are usually defined as manned aircraft and unmanned aerial vehicles (UAVs). Opportunities for employment of these systems is typically limited to the fixed nature of aircraft related support facilities and a relatively small operational battlespace. With the exception of those aircraft possessing in-flight refueling capabilities, aircraft and UAVs are typically capable of achieving relatively shorter ranges than theater missiles.

They normally fly at speeds much lower than ballistic or air-to-surface missiles. This means that while aircraft, cruise missiles and UAVs used in operations against a force are exposed to defensive fires for tens of minutes, the opportunities to engage other theater missiles are measured in seconds.

Additionally, manned aircraft are limited in maneuverability to the G-forces tolerable by a human being, making engagements of them a relatively simpler geometric problem than engagements of missiles not limited in this way. While current theater missiles do not take active evasive action against missile defenses, future systems may be able to detect and avoid active defenses with greater efficacy than manned aircraft.

System Evolution

As mentioned earlier, a brief look into the development of active defense systems was necessary to determine the scope and importance of the doctrinal debate. Active defense systems had evolved to meet missile threats and active defense doctrine had evolved or was evolving to drive the defense systems. An understanding of the former was required to move to an understanding of the latter.

How was the Department of Defense allocating budgets for development and fielding of active defense systems? What priorities had been set, if any, for program budget allocations, future developments or system fielding? To what extent were the services involved in JTMD? These questions might point to a future direction for TBMD and for the evolution of active defense doctrine.

Overview

The National Ballistic Missile Defense Program is structured under BMDO to respond to existing and emerging ballistic missile threats to the United States, its forces abroad, and its allies. This defense program is responsible for guiding the development of active defense systems that the services will field and deploy in support of the CINCs missions. Theater missile defense systems have evolved in concept and development from initial deployments of upgraded Army Patriot battalions and Navy Aegis cruisers in Desert Storm to advanced technology systems still in research and development.

As recently as 1993, the BMDO planned a two-tier defense architecture consisting solely of Theater High Altitude Area Defense (THAAD) and Patriot systems. This seemed to be more a compilation of systems already under development than a systematic approach to defeating the missile threat. Under the 1993 architecture, THAAD would engage missiles in the upper atmosphere to provide extended coverage over the entire theater and Patriot would engage in the lower atmosphere to provide point defense of critical assets.[3]

The services were all vociferous about the need for theater missile defenses and the role that they should play in meeting the missile threat. With new budget money coming available for TMD systems, the Navy began pushing its Aegis and naval upper-tier concepts, the Army was selling its Patriot, THAAD, and concept systems, and the Air Force began pushing for boost-phase interceptors, a capability for which they were clearly best suited.

Navy TMD systems were included in a BMDO report to Congress under "Other TMD Development Programs," even though BMDO had acknowledged the

JROC's validation of the need for naval TMD. The National Defense Authorization Act for FY 1993 specified that not less than $90 million should be made available for exploring naval TMD possibilities.[4]

The Army's Corps Surface-to-Air Missile was also mentioned as being in the early stages of development, but was not included in any discussion of TMD architecture. Clearly, BMDO was still in the early stages of assembling a feasible and logical response to the growing threat from theater missiles.

Current and Future Systems

Currently, with the lack of a credible intercontinental ballistic missile threat to the United States, priority for program funding and development is placed on theater missile defense programs. Additional funding is dedicated to two other "pillars" of missile defense. National Missile Defense (NMD) programs designed to defend the United States from external missile threats, and the Advanced Technology Program (ATP); which is responsible for continuing national research on increasingly advanced missile defense systems.

Recognizing that a single TMD system cannot defend against all the potential missile threats or protect the vast variety of targets in theater, DoD has directed the BMDO to pursue a "family of systems" approach to the anti-missile challenge.[5] This family of systems, some still under development, is designed to provide a defense in depth, using multi-tiered defenses against both long and short-range theater missiles. Boost or ascent phase interceptors will engage missiles shortly after launch, destroying them over enemy territory and

eliminating the collateral damage that could result from debris falling over friendly forces.

An upper tier of defense engages missiles at long-range and high altitude (sometimes outside the atmosphere), and provides protection over an extended area such as an entire theater. This capability is especially key if the incoming missile is carrying a nuclear, chemical or biological warhead.

Finally, lower tier systems intercept missiles that leak through the other tiers and those short-range, low altitude ballistic missiles that can underfly the upper tier defenses. This tier also provides the only defense against cruise missiles and aircraft. Currently, the only systems developed and deployed with forces are lower-tier systems which are relatively lacking both in launch platform mobility and in intercept range. In the future, lower tier systems will be generally more mobile and better capable of protecting the force over extended ranges and in increased areas of operations.[6]

In general, the programs in DoD's "family of systems" include the Patriot Advanced Capability-3 (PAC-3) system, Navy Area Defense, Medium-Extended Air Defense System (MEADS), Theater High Altitude Area Defense (THAAD) and Navy theater Wide systems. Additionally, the Air Force is developing a boost-phase intercept system called the Airborne Laser (ABL). If successful, this system will destroy missiles during their vulnerable boost phase, typically the first two minutes of flight, and eliminate the possibility of planned or incidental warhead disintegration over the target area. A more detailed discussion of current and planned future systems follows.

Patriot

The Patriot is a relatively mobile, lower-tier system currently deployed with Theater Army and Corps air defense units. It was, during Desert Storm, the first system to successfully engage an incoming ballistic missile and remains the progenitor of all lower tier systems. It uses guided missiles to simultaneously engage and destroy multiple targets at varying ranges.

A Patriot battalion has five line batteries, each with an integral phased-array sensor, control van, and eight launchers with four missiles each. This gives a Patriot battalion a before-reload capability of 160 missiles.

Patriot Advanced Capability 3 (PAC-3)

Material changes to the current Patriot PAC-2 capability include a hit-to-kill missile with increased lethality and remote launch capability. Changes will also include improvements in communications and computer software and radar upgrades that improve tracking and target handling capability against both air-breathing and theater missile threats. These improvements will expand the size of the engageable battlespace and will increase the system's multiple target engagement capability, overall lethality and joint system interoperability.[7]

Theater High Altitude Area Defense (THAAD)

The THAAD system fulfills user (CINC) requirements for a multiple shot, upper-tier engagement capability. Multiple shots against the same upper-tier target are desirable when the threat missile may be carrying weapons of mass destruction. The THAAD program is currently in

demonstration and validation, and is undergoing a series of flight tests. If it is successfully deployed, THAAD will have a more capable wide-area-defense radar which will provide surveillance and fire control support for THAAD interceptors and cueing support to lower-tier systems such as Patriot.[8]

Additionally, the THAAD radar will provide a capability to perform threat classification against ballistic missiles. This will give TMD defenses and operational planners a clear indication of the exact missile threat being faced and may allow for the introduction of additional countermeasures against specific threat missiles. The THAAD radar will also have the capability to make kill assessments after intercept, increasing system lethality and decreasing redundant engagements.

The THAAD interceptor is a hit-to-kill missile which incorporates state-of-the-art guidance, control and kill technology. The missile has a greater range, higher maximum altitude and more warhead lethality than any system currently fielded and will provide a limited high endo, low exo-atmospheric defense capability (against ICBMs) in the event of national emergency.[9]

Navy Area Theater Ballistic Missile Defense

Navy area TBMD is a lower-tier system leveraged from upgrades to current Aegis cruisers and destroyers equipped with the standard missile. Changes from the current baseline system will include addition of an IR seeker and modifications to the warhead. Navy Area TBMD is valuable because it can be forward deployed in-theater to provide coverage until other systems are available. It has a 360-degree

surveillance capability, controls its missiles by command guidance, and utilizes both semi-active radar and IR homing. Like the THAAD it has an additional capability for automated engagement of multiple targets and could provide limited endo-atmospheric defense against ballistic missiles in the event of a national crisis.[10]

Hawk

While not funded under the BMDO's ballistic missile program budget, the Marine Corps' TMD system is based on Hawk, a mobile surface-to-air guided missile system. Hawk has a 360-degree surveillance and engagement capability, interceptor guidance by a separate fire control radar, and the ability to engage multiple targets. Like the Patriot, it was initially designed to defeat air-breathers, but has been modified to provide the Marine Corps with a very limited defense capability against SRBMs as will.

US Army Hawk systems now employed with reserve components do not have TBM defense capabilities, but are capable of detecting and engaging a limited variety of cruise and air-to-surface missiles.

Future Systems: Beyond 2002

The BMDO is currently exploring concepts for several other TMD systems. Navy theater-wide TMD, corps SAM, and the airborne boost phase interceptor program are all being considered for concept development and possible future deployment.

The Navy Theater-Wide or upper tier program will provide an exo-atmospheric sea-based capability comparable to THAAD to counter medium- and long-range theater ballistic missiles. This system would be

capable of intercepting missiles in both the ascent and descent phases of a ballistic missile's flight. Currently the program is a concurrent engineering effort that includes both concept development and advanced technical demonstration phases. This system is not planned for fielding until after 2002.

Summary of System Developments

During research it was thought that any major differences discovered in the concept, characteristics or design of service active defense systems might be useful in explaining the nature of differences, if present, in service doctrines. Research was conducted to determine in general terms, how the services' active defense systems were similar or different.

The system descriptions given above might seem similar at first glance, but differences do exist. The first major difference is in system fielding and availability. The Army currently possesses the bulk of theater missile active defense assets deployable for the CINCs. They also own the bulk of assets **forward deployed** in geographic theaters. Patriot units make up the lion's share of the defense capability and are actively deployed on operations in Saudi Arabia and in Korea. They are also deployed with U.S. and NATO countries in central Europe and provide defense not only against TMs but also hostile aircraft.

The Navy and Marine Corps possess the greatest inherent capability to rapidly **force project** TMD into an existing or new theater of operations. Because of the force projection mission given to them, the Navy and Marine Corps are often the first services to deploy in times of tension or crisis. Both services possess a limited lower-tier

engagement capability with Aegis and Hawk that can be rapidly fed into theater to protect air and sea ports of debarkation for follow-on forces deploying into theater.

Navy capabilities will be greatly enhanced by modifications to the Aegis Spy-1 radar and Standard missile. This will increase the engagement capability and lethality of the system, increasing proportionately the importance of Navy and Marine Corps force projection of TMD. Air Force active defense systems are still in the conceptual and developmental phases, but are not designed to engage within the lower-tier in any case. The Air Force does supply a major portion of the BMC4I infrastructure and sensors required to provide early warning and targeting data to lower-tier systems.

Lower-tier systems require abundant near real-time missile launch information and target cueing to ensure sufficient time is available for multiple engagements. Because they only engage missiles during the descent phase lower-tier systems have more time to prepare if warned, but less time to react if not warned. Limitations in target kill assessment capabilities and incredibly short windows of opportunity for engagement mean that lower-tier systems must often shoot-shoot-look in order to ensure that the incoming missile is killed. These limitations would seem to make lower tier systems incredibly dependent on maximum centralized sharing of real-time and near real-time information and similar decentralized control of missile engagements.

The second major difference between the service systems is in engagement phase execution. Army Patriot, Navy Aegis, and Marine Corps Hawk all engage ballistic missiles in the lower tier, or final phase of

missile flight. Army THAAD and Navy Theater-Wide systems will engage ballistic missiles in the upper tier or midcourse phase of missile flight. These upper-tier systems will also provide a limited capability to defend against ICBMs during times of national crisis.

Upper-tier systems also require abundant near real-time missile launch information and target cueing, but for different reasons. Because upper-tier systems engage early in the missile's flight path they need near-instantaneous notification of launch in order to engage the threat missile before it reaches the dangerous descent phase. The short warning-engagement window suggests a need for maximum centralized control of engagements.

Currently, only the Air Force has a boost-phase intercept system under development, though BMDO concept exploration activities include employing airborne laser systems with Navy high performance aircraft. This is a concept which could equally translate to future inclusion on Marine Corps battlefield interdiction aircraft or with miniaturization, on other deep attack assets.

The Air Force has the inherent preponderance of strategic and operational assets deployable in depth against enemy missile launch platforms and support structure. Because of this, the Air Force will probably continue to favor development of systems which destroy launch platforms before missiles can be fired (attack operations) and failing that, during boost phase.

The integration of Army and Navy current lower-tier and future upper-tier systems will provide the CINC a greater defense in depth from enemy ballistic missiles. The Navy's early force projection capability

and the Army's sustainability over the long term provide the CINC a range of options that he can employ to significantly enhance the survivability of the force.

These system differences seem to be natural extensions of the roles of the services. Navy and Marine Corps units would provide lower and upper-tier TMD coverage during entry or redeployment operations. Air Force systems, once developed would provide extended-range deep strike and early warning and engagement of missiles and missile platforms. Finally, Army lower and upper-tier systems would provide long-term sustainable coverage to the theater during prosecution of the operation or campaign. In the optimum scenario all four services would employ their various systems in synchronization to form a virtual leak-proof umbrella of TMD coverage over the CINC's forces.

Doctrinal Review and Comparison

The first subproblem to the thesis question was to identify, analyze and interpret the existing joint and service doctrine on command and control aspects of active defenses against ballistic and cruise missiles. As has been mentioned earlier, this required a doctrinal review. This review established a frame of reference for the doctrinal debate and provided a point of departure for doctrinal comparison and analysis.

Based on the information gathered and the trends discussed earlier that were discovered in service active defense systems, it was thought that there might exist similar trends in doctrinal development. To that end the research set out to answer the question: In what ways were the service's active defense doctrines, if they had already been written, an

extension of the capabilities inherent in their anti-missile systems? Additionally, in what ways were service's active defense doctrines similar or different?

Counterair Operations Doctrine

Historically, each of the military services has owned and commanded a portion of theater air defense assets controlled and coordinated by the air component commander. Air defense platforms and command, control, and intelligence systems developed independently by the services have been redundant at times, have often competed for use of airspace once deployed, and significantly, have vied for limited research, development and modernization funding.

Air Defense doctrine was historically driven by the nature of the threat and the capabilities of the systems available to the CINCs. Cold War planners envisioned massive waves of Soviet bombers and ground attack aircraft both preceding and supporting the advance of maneuver units. NATO and US joint planners wrote doctrine that called for early engagement of Soviet aircraft and facilities through offensive counterair (OCA) and interdiction operations respectively.

Enemy aircraft that were not destroyed on the ground or in the first few minutes of flight by interdiction and OCA would face defensive counterair (DCA) fighters and interceptors. DCA aircraft could be easily vectored from preplanned combat air patrols (CAPs) or launched from ready runways within theater.

As a final line of defense, US Army and Allied Air Force ground air defense systems would provide area and point coverage of critical assets and units in theater. Army high and medium altitude air defenses

supported the Army Theater and Corps Commanders' concept of the operation, but were plugged into the integrated air defense system (IADS) and controlled by Air Force control and reporting centers (CRCs)under Air Force Sector Operations Controllers (SOCs).

Army and Marine Corps short range air defense (SHORAD) systems (SHORAD) were integrated into the overall air defense system but were normally decentralized in execution. The needed responsiveness of short-range weapons required that the authority to engage aircraft be delegated to the weapons commander. Nevertheless, SHORAD remained subject to the AADC's rules and procedures in the form of weapon control statuses.

The only doctrinal exception to this rule for US Army units however was that weapon control status authority against helicopters was (and is) normally designated to the appropriate land maneuver force commander. For Marine Corps units, weapon control status authority was (and is) designated to the appropriate air command control organization. SHORAD units in defense of rear area critical assets, such as airfields, were integrated into the centralized air defense system.

This was a logical, seamless system that provided maximum coverage and early engagement capabilities to the CINC, while limiting the possibilities for redundant engagements and fratricide. Service doctrines evolved to support this framework and subsequent weapons systems were increasingly designed to plug into the appropriate IADS level with the adequate capability for joint and allied interoperability built-in.

The overall doctrinal theme of joint air defense is early engagement through offensive operations. In fact, air defense is included as described above, as a small portion of the overall counterair scheme of operation. Joint Publication 3-01.2, Joint Doctrine for Theater Counterair Operations describes the exact manner in which air defense forces are employed:

> forces are integrated into the local area air defense system in accordance with the established joint operational procedures and the overall air defense priorities of the joint force commander and of intermediate land force commanders. Air defense units assigned to Army corps, MAF, or lower maneuver echelons are under operational control of the echelon commander, who employs the assigned units under the weapons control procedures and measures established by the AADC. Positioning of surface-to-air systems is reported to the AADC to allow appropriate adjustment of the weapons control status and airspace coordination in the area. Air defense assets not assigned to Army corps, MAF, or lower maneuver echelons are normally under the operational control of the AADC.[11]

Theater Missile Defense Doctrine

As discussed earlier in this thesis, the geographic combatant commander is responsible for establishing theater guidance and objectives for JTMD and for assigning and apportioning forces and resources. JTMD plans and operations are integrated at theater level under the supervision of the geographic combatant commander and documented in the appropriate operation plans and annexes. This is an exact duplication of the geographic commander's responsibility in theater air defense.

Additionally the JFC establishes guidance and objectives for JTMD within his area of operations and defines and implements a methodology for TMD activities. This guidance is published in appropriate joint operation plans and annexes and monitored by the joint force staff. Component commanders jointly conduct JTMD operations under the guidance

and in support of the objectives of the JFC. JTMD considerations and objectives are outlined in the JFC's concept of the operation.[12]

Again, up to this point there are no irregularities between joint theater air defense (counterair) and missile defense doctrines. The JFC apportions forces, sets priorities, and delegates authority to a subordinate commander, in this case the area air defense commander.

Active Defense Doctrine

Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, vests overall responsibility for active defenses of TMD in the AADC, who is usually also the joint force air component commander (JFACC). The AADC/JFACC:

> assists the joint force commander (JFC) in determining missions, communications priorities, and rules of engagement for active defense forces based on assessment and prioritization of forces, critical assets, and population centers to protect. Active defense forces are under the operational control of their component commanders, who employ these forces under the weapons control procedures and measures established by the AADC and approved by the JFC.[13]

Active defense capabilities currently exist and are employed with Army, Navy and Marine Corps units which are operationally controlled by their component commanders. Doctrinally however, TMD unit missions, protection priorities, and rules of engagement may be determined by the Air Force component commander in his role as the AADC. While operational control is clearly given to the service component commanders on the one hand, it is effectively taken away by giving the AADC responsibility and authority for planning, prioritizing and controlling the weapons systems on the other. Operational control of active defense TMD assets is vested in the service component commanders, tactical control remains with the air component commander.

Army Doctrine

Army doctrine expects the JFC to establish a Joint Force Missile Defense Coordinator (JFMDC) who will be responsible under the JFC for planning, coordinating and deconflicting JTMD operations in coordination with service or functional component commanders, the joint staff and the AADC. The AADC retains responsibility for coordinating active defense measures, but Army doctrine envisions multiple layers of coordination between services and systems.

First, the ARFOR's deep operations coordination cell coordinates with other services through the Battlefield Coordination Element (BCE). The Army service component commander provides the BCE and positions it offshore or with the Air Operations Center (AOC) or theater equivalent. The BCE is responsible to the ARFOR commander and coordinates with the G3 to provide necessary tactical air support and coordinating Air and Missile Defense operations.

Second, the Air and Missile Defense command (AMDC) commands the EAC ADA brigades, ATDME, and the ARFOR's BCE. It provides air and missile defense coordination through the Theater Army Air Defense Coordinator (TAADCOORD) and the Missile Defense Coordinator (MDCOORD). The commander of the AMDC is normally the TAADCOORD and MDCOORD. The AMDC coordinates all AD and TMD operations for the ARFOR to provide theater operational protection against enemy air operations to include theater missile attacks.[14]

Within the structure of the AMDC, the G2/G3 sections form the Army Theater Missile Defense Element (ATDME) to provide the JFC and ARFOR commanders the ability to exercise control of Army theater missile defense assets. The ATMDE as the MDCOORD or in support of the MDCOORD focuses on TMD operations for the ARFOR commander and is responsible for collection and analysis of intelligence and for coordination of TMD missions across all TMD operational elements. The ATMDE would have

linkages to every unit involved in JTMD and would provide the JFC with a central nexus for Army attack operations, and active and passive defense. The ATMDE could also act as the JFMDC, and possibly the deputy AADC.[15]

Army doctrine recognizes the existence of other service capabilities and the importance to link closely with them to provide complete theater coverage. It establishes a Theater Air Defense Coordinator (TAADCOORD) to ensure that Army air and missile defense is coordinated with joint active defense operations and planning at the theater level. To ensure that the ATMDE is capable of establishing command, control and communications links with other service JTMD operations, the army has established a force projection tactical operations center capable of handling the demanding tasks of coordinating JTMD activities.

Navy Doctrine

While there is not an abundance of written Navy doctrine, the Navy's "Operational Maneuver From the Sea" does stress the importance of forward engagement and retaining the ability to project force ashore where necessary. The late Admiral Jeremy Boorda, past Chief of Naval Operations, and General Carl E. Mundy, Jr., past Commandant of the Marine Corps, agreed in 1994 that the "first priority" for the naval services was the rapid fielding of a Navy TBMD capability.[16]

According to Rear Admiral John T. Hood, the Navy's Program Executive Officer for Theater Air Defense, future Navy TMD systems will be capable of linking with Army and Marine Corps ground air defense systems to establish theater-wide coordination of JTMD operations.[17] Navy air defense commanders are specially placed early in theater to provide extended coverage over the force during entry operations. "Navy shipboard TMD capabilities would actually protect the airfields used by

airlift transports from ballistic and cruise missile attacks during the initial phase of a conflict."[18] The Navy's integral air attack assets are linked to JTMD operations through the Navy air defense commander.

Air Force Doctrine

There is currently no written Air Force joint theater missile defense doctrine available. Air Force doctrine discusses attack operations and interdiction missions, but has not yet evolved to include doctrine for active missile defenses. This seems to be a natural consequence of the role of the service and the evolution of its offensive deep strike doctrine and systems. The Air Component Commander, in his capacity as AADC and the designated airspace control authority, will be responsible for limiting fratricide of friendly transiting aircraft. To this end he will establish rules of engagement, weapons control statuses and procedural airspace control means to help active defenses distinguish between friendly aircraft and threat missiles.

Discussion

This thesis examined the active defense doctrine of the separate services to determine how were their missile defense doctrines might be similar or different, complimentary or contradictory. The relative newness of the subject made it difficult to find any doctrine that was established and coordinated among the services. The Army's concept of a JTMDC is not included as part of Joint Pub 3-01.5, Joint Theater Missile Defense Doctrine. Navy and Air Force literature focuses more on the need for those services to be involved in JTMD and included in future

funding than it does on recommending doctrine for employment of current or future systems.

It appears that existing counterair doctrine *was* used as a model for anti-missile doctrine. The duties of the JFACC and AADC were expanded to include TMD operations while the JFC retained overall responsibility for prioritizing and planning JTMD. It is here that one of the major anomalies was discovered. Joint Force Pub 1-02 defines the AADC in the following manner:

> within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the area air defense commander's headquarters.[19]

The air threat continues to evolve from air-breathing aircraft to increasingly more sophisticated and greater numbers of theater missiles. As the air threat moves towards missiles the preponderance of air defense (missile defense) capabilities will rest with the Navy, Army and Marine Corps air defense systems. At this point it would seem that any of the services, depending on the situation and the CINC's needs and desires should be capable of acting as AADC and/or JTMDC.

Joint doctrine must evolve to include consideration of a central focal point for coordination of TMD. The Army's JTMDC or similar coordinator under the AADC might be the answer. A separate JTMDC coordinating the preponderance of air defense assets (missile defense assets) alongside or above the AADC might be the path of the future.

U.S. military history is fraught with examples of infighting and positioning among the services on issues of roles and missions. Most often tied to budgets and resources, and sometimes linked to pure

loyalty and faith in a service's "natural capability," these tendencies resemble nothing more than human instincts for self preservation.

In this arena at least, the services must work with the CINCs to establish clear, indisputable guidance as to who owns, who commands and who controls active defense assets. Joint forces cannot afford to be hamstrung by inter-service rivalries and competition when the threat is so great and the capability to defend against it so limited.

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[1] Joint Publication 1, Joint Warfare of the Armed Forces of the United States, (Washington, DC: Director for Operational Plans and Interoperability, Joint Staff, DoD), III-10.

[2] The Last Fifteen Minutes, Joseph Cirincione and Frank von Hippel ed., (Washington, DC: Coalition to Reduce Nuclear Dangers, 1997) 6-12.

[3] "Ballistic Missile Defense, Evolution and Current Issues: Report to the Chairman, Committee on Government Affairs, U.S. Senate," (Washington, DC: DoD, 1993), 46.

[4] Ibid., 48-9.

[5] "FY 1998 President's Budget Press Release," (Washington, DC: BMDO, 1997) 1-4.

[6] "US Ballistic Missile Defense Programs," (Washington DC: BMDO, 1997) 1-2.

[7] FM 100-12, US Army Theater Missile Defense Operations, (Ft. Monroe: TRADOC, 1996), C-23.

[8] FM44-91 (Initial Draft),Theater High Altitude Area Defense Battalion and Battery Operations, (Ft. Bliss: US Army Air Defense Artillery School, 1996) A-1-8.

[9] "FY 1998 President's Budget Press Release, (Washington, DC: Office of Management and Budget, 1997), 1."

[10] Ibid.

[11] Joint Publication 3-01.2, Joint Doctrine for Theater Counterair Operations, (Washington, DC: Joint Staff, 1986), III-4.

[12] Joint Publication 3-01.5, Joint Publication for Theater Missile Defense, (Washington, DC: Department of Defense, February 1996), II-1.

[13] Ibid., xi.

[14] Coordinating Draft of FM 100-12, US Army Theater Missile Defense, (Ft Bliss: US Army Air Defense Center, 15 April, 96), 4-9 to 4-12.

[15] Ibid.

[16] Rear Admiral John T. Hood, USN, "Navy Theater Ballistic Missile Defense: Cornerstone for 21st Century Joint Operations," (Marine Corps Gazette, July, 1995), 32-34.

[17] Ibid.

[18] Glenn W. Goodman, Jr. "Unfurling a Leakproof Umbrella: Navy Theater Ballistic Missile Defense's Time Has Come," (Armed Forces Journal International, April, 1995), 22.

[19] Joint Pub 1-02, Department of Defense Dictionary of Military Terms, (Washington, DC: DoD, 23 March, 1994), 35.

CHAPTER FIVE

> If there is an attitude more dangerous to assume that future wars will be just like the last one, it is to imagine that it will be so utterly different that we can afford to ignore all the lessons of the last one.[1]
>
> Sir John Slessor,
> Joint Pub 3-01.5, Joint TBMD

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

The purpose of this thesis was to examine the current doctrine, command and control infrastructure, and TBM defense system technologies in relation to active defenses against the threat in order to answer the question: Who should control active defenses against ballistic and cruise missiles? While seemingly subjective in nature, this question can have a number of logical and objective answers, depending on the assumptions made and the criteria used in formulating conclusions.

It would seem reasonable to assume, given the threat picture described by the prevailing literature, that future conflicts requiring defenses against theater missiles may be fought in any degree of conflict and in practically any geographic theater environment. It would also be safe to assume that the ratios of threat aircraft to threat theater missiles will differ from theater to theater. Theater air threat sets might be characterized as either air-heavy, missile-heavy, or balanced air-missile.

As discussed, each of the services possesses unique capabilities which contribute to the defense against theater missiles. Given the range of combinations of theater environments and threat sets that could

be encountered, and the complexity of the missile defense fight, it seems illogical to assign the doctrinal responsibility for control of active defenses to any one service in peacetime.

Despite subtle differences between them, counter-air operations and counter-missile operations are probably the closest match in terms of threat characteristics, defense systems capabilities and the inherent possibility of pilot fratricide. Given the similarities between them, it would seem logical to assume that joint doctrine for the latter would evolve from joint doctrine for the former.

The seriousness and probable future expansion of the missile threat is a stark contrast to the current limited active defense capabilities of the services. Given this dichotomy, it is imperative that two changes to the current situation be made before additional active defense systems are fielded.

First, Joint Publication 3-01.5, Joint Doctrine for Theater Missile Defense, should be rewritten to provide adequate guidance to the CINC reference control of active defenses. Currently, ambiguities and lack of clear direction in the doctrine promote infighting between the services, most notably the Army and Air Force. Joint counter-air doctrine dictates that the service with the most assets and greatest capability to defeat the air threat will provide the AADC and command and control nodes for the CINC. It seems logical that a similar provision would be made in missile defense doctrine, especially considering the diverse capabilities across and among the services. A new passage in JP3-01.5 might read:

The JFC assigns overall responsibility for JTMD to a single coordinator, the Joint Forces Missile Defense Coordinator (JFMDC). Normally, the JTMDC will be the Service component commander who has the preponderance of missile defense assets to be used and the ability to assume that responsibility. The successful conduct of theater missile

defense requires the integrated operation of all available missile defense weapon systems of all service components. The JFMDC is responsible for planning, coordinating and deconflicting JTMD operations. Authority to integrate missile defense forces and operations in overseas land areas will be delegated to the JFMDC. The JFMDC, in coordination with the AADC (if they are separate) and all component commanders, develops plans for dissemination of early warning and cueing information to active defense elements by the fastest means available. Missile defense operations should also be coordinated with other tactical operations, both on and over land and sea. Representation from the other components involved will be provided, as appropriate, to the JFMDC's headquarters. The tactical and strategic forces that may be committed to anti-missile operations, as well as other contributing forces such as SOF, elements of Army, Navy, Air Force, and Marine aviation, surface air and missile defense, and EW forces, remain under the command of their respective components.

This suggested concept for new doctrine provides for a central coordinator for JTMD operations that can doctrinally come from any service, has the authority to control operations of all the services, yet leaves responsibility for command of operational forces to the service component commanders.

Second, the services should work together to field a joint TBMD command and control cell which could be employed by any service to control TBM defenses. Currently, no service possesses the capability to handle all aspects of TBMD with equal facility. With a common command and control cell, the CINC could appoint a Joint TBMD Coordinator from whichever service was best suited and most capable of defeating the threat in a given geographic theater at a particular point in time.

Clearly, mission success derives directly from building an appropriate force, and establishing clear doctrine under which it will

train, deploy and fight. Service TBMD C4I systems should be sufficiently interoperable to respond to the needs of joint and multinational command structures. Information critical to JTMD operations should be easily handled by any service system. Likewise, to be efficacious, each service BMC4I system should be capable of controlling operations across the spectrum of JTMD.

Because of the relative newness of the field and the corresponding paucity of literature on missile defense theory and doctrine, a number of subjects present themselves for further study. For ease of discussion, these recommendations have been divided into national, joint, and service studies.

Study With National Implications

On a national level, the implications for future development of Theater Missile Defenses under restrictions imposed by the recent Helsinki agreement need investigation. Under this agreement, the US and Russia made distinctions between what constitutes TMD and what constitutes NMD.

Future systems will be limited in development, testing and production by the type of missile which they are capable of engaging and in some cases the specific platform from which they launch. Space-based sensors and cueing are allowed for example, so long as they direct the fires of TMD systems, while space-based lasers are specifically prohibited. Clearly, future limitations on system development will have an impact on the way that missiles are fought and that anti-missile doctrine is developed.

Studies With Joint Implications

At the joint level, the nature of the relationship between air and missile defenses warrants additional research. While a number of striking similarities exist between the two, a like number of

recognizable differences exist as well. Are the concepts of theater counter-air and missile defense characteristically similar or are they sufficiently dissimilar to deserve separate doctrines and operational warfighting designs?

Answers to this question might drive a doctrinal debate on the relative need for a JTMDC and/or AADC depending on the air threat set in theater. While a JFACC will remain essential to the CINC's warfighting campaign, the AADC might be less efficacious than a JTMDC in non-air, missile-heavy, threat scenarios.

Also, serious consideration and research might be dedicated to exploring the possibility of completely de-linking operational command and control of air defenses from missile defenses. As digital technology begins to allow to commanders to have real-time positioning and cueing information anywhere on the battlefield, concerns for fratricide and redundant engagements will be greatly reduced. It might be possible with current technology for linked TMD systems to 'know' whether an incoming object is a theater missile, whether or not it has been engaged, and what the ongoing chances for successful engagement are. In this way, linked TMD system engagements could be completely decentralized, leaving the operational commander greater control over unit moves, locations and in some cases, defense priorities.

Study With Implications for the Army

Within the Army, capabilities for performing attack operations against theater missile launch platforms and infrastructure should be explored in depth. ATACMS, attack helicopters, MLRS, and/or Army SOF direct action teams might be capable of conducting a respectable portion of TMD attack operations given adequate doctrine and training. A developed attack capability by the Army could be a valuable tool for the

CINC in some scenarios where environment or terrain limit the employment of naval or air forces.

Finally, Army planners need to coordinate in advance the way in which they will interact with, provide support for, and in some cases command and control the TMD assets of the other services. The current ad hoc nature of much of U.S. JTMD may not be sufficient to win a future war in which the enemy deluges theater targets with missiles. The key here is clear guidance and agreement, in advance and in writing, that has been put to practice in multiple joint exercises under various conditions.

Summary

Leaders need to take seriously the ways in which future enemies will fight us. As discussed, the future trend for air threats in many geographic theaters will be greater numbers and sophistication of missiles and fewer and less advanced aircraft. This trend places a high priority on missile defenses and missile defense doctrine. As the number of countries with ballistic and cruise missiles increases, the threat to U.S. forces abroad expands exponentially.

Doctrine, training, missions, organizational structures, and system design and development all play important roles in increasing lethality against theater missiles while reducing risk to US and allied forces. This goal should be the predominant theme in any discussion of future TMD design. U.S. and allied planners must work hard to balance capabilities with requirements and adopt some combination of service and system capabilities to meet all future missile threats. Lessons from past wars are instructive, though not a panacea.

Joint warfare will remain an integral part of U.S. military doctrine for the foreseeable future. CINCs must know they can depend on the services to field interoperable and mutually supporting systems and

equipment. Joint doctrine must assist, rather than hinder the CINC's warfighting abilities. Supporting doctrine, clearly written and unambiguous in nature may help prevent the requirement to establish ad hoc command and control structures in future wars, and could provide the CINCs added flexibility and responsiveness for winning the air and missile fights.

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[1] Joint Publication 3-01.5, Joint Doctrine for Theater Missile Defense, Washington, DC: DoD, February, 1996), II-7.

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